

## WHAT IS CLAIMED IS:

1. An apparatus for handling packages between a pickup location and a spaced destination location, comprising:

5 a clamshell gripper means adapted to be attached to a robotic arm;

a first means for moving said clamshell gripper means between a clamped position and an unclamped position;

a fork-type loader adapted to be attached to the robotic arm;

10 a second means for moving said fork-type loader between a pick position and an open position; and

control means connected to said first and second means for moving, said control means selectively operating said clamshell gripper means and said fork-type loader in independent and cooperative modes whereby said clamshell gripper means engages opposite sides of a package in said clamped position and said  
15 fork-type loader supports a bottom of the package in said pick position.

2. The apparatus according to claim 1 including an overhead base unit adapted to be attached to the robotic arm, said clamshell gripper means and said fork-type loader being mounted on said overhead base unit.

20 3. The apparatus according to claim 1 wherein said clamshell gripper means further comprises a first side support mechanical linkage coupled to a first side support plate, said first side support mechanical linkage being pivoted about a first pivoting member, said first side support plate being adapted to engage one of the opposite sides of the package.

25 4. The apparatus according to claim 3 wherein said clamshell gripping mechanism further comprises a second side support mechanical linkage coupled to a second side support plate, said second side support mechanical linkage being pivoted about a second pivoting member, said second side support plate being adapted to engage another one of the opposite  
30 sides of the package.

5. The apparatus according to claim 4 wherein said first side support mechanical linkage and said second side support mechanical linkage are mounted to transition between said unclamped position and said clamped position in an arc-like motion.

5 6. The apparatus according to claim 4 including a base unit, said first and second side support linkages being pivotally mounted on said base unit for movement between said unclamped and clamped positions with an arc-like motion.

7. The apparatus according to claim 4 wherein said first means for moving includes a  
10 pair of pneumatic cylinders each connected to an associated one of said first and second side support linkages, said cylinders being connected to said control means for actuation.

8. The apparatus according to claim 1 wherein said fork-type loader includes at least one arm being pivotally mounted and having one end connected to said second means for  
15 moving and an opposite end, and a fork-type support member attached to said at least one arm opposite end for engaging and supporting the bottom of the package.

9. The apparatus according to claim 8 including a base unit, said fork-type loader being pivotally mounted on said base unit for movement between said pick and open  
20 positions with an arc-like motion.

10. The apparatus according to claim 1 wherein said second means for moving includes a pneumatic cylinder connected to said fork-type loader, said cylinder being  
25 connected to said control means for actuation.

11. The apparatus according to claim 1 including an upper support pad moveable between an engaged position for engaging an upper surface of the package and a disengaged position.

12. The apparatus according to claim 11 wherein said upper support pad is positioned  
30 above said fork-type loader when said fork-type loader is in said pick position.

13. The apparatus according to claim 11 including a pneumatic cylinder attached to said upper support pad, said cylinder being connected to said control means for actuation.

14. The apparatus according to claim 1 including at least one of a soft stop means and a hard stop means connected to said control means for selectively limiting at least one of said unclamped position and said open position to less than a full travel.

15. The apparatus according to claim 14 wherein said soft stop means controls at least one of said first and second means for moving.

16. The apparatus according to claim 14 wherein said hard stop means includes a stop for engaging one of said clamshell gripper means and said fork-type loader and a stop actuator connected to said control means for selectively moving said stop.

17. A material handling apparatus for moving packages between a conveyor and a destination location, comprising:

a robotic arm having a free end;

a clamshell gripper means pivotally attached to said free end of said robotic arm and extending on opposite sides of a longitudinal axis thereof;

a first moving means attached to said free end of said robotic arm and to said clamshell gripper means for moving said clamshell gripper means between a clamped position and an unclamped position;

a fork-type loader attached to said free end of said robotic arm and being positioned adjacent one side of said clamshell gripper means;

a second moving means attached to said free end of said robotic arm and to said fork-type loader for moving said fork-type loader between a pick position and an open position; and

control means connected to said first and second moving means for selectively operating said clamshell gripper means and said fork-type loader in independent and cooperative modes whereby said clamshell gripper means engages opposite sides of a package in said clamped position and said fork-type loader supports a bottom of the package in said pick position.

18. The apparatus according to claim 17 including at least one of a soft stop means and a hard stop means connected to said control means for selectively limiting at least one of said unclamped position and said open position to less than a full travel.

5        19. The apparatus according to claim 17 including an upper support pad attached to said free end of said robotic arm and a third moving means attached to said free end of said robotic arm and said upper support pad, said third moving means being connected to said control means for moving said upper support pad between an engaged position for engaging an upper surface of the package and a disengaged position.

10        20. The apparatus according to claim 17 wherein said clamshell gripper means includes a pair of side linkages positioned on opposite sides of said longitudinal axis, at least one of said side linkages being movable transverse to said longitudinal axis, and an actuator means connected between said at least one of said side linkages and said free end of said  
15        robotic arm for moving said at least one of said side linkages relative to another one of said side linkages to adjust a spacing between said side linkages in said clamped position.

21. An apparatus for handling packages between a pickup location and a spaced destination location, comprising:

20        a gripper unit adapted to be attached to a robotic arm, said gripper unit having  
              opposed arms with fork-type support members;  
              an actuator means coupled to said arms for moving said fork-type support members  
              between a pick position and a maximum open position; and  
              an adjustable stop actuator for selectively limiting movement of at least one of said  
25        arms to a limited open position different than said maximum open position.

22. The apparatus according to claim 21 including control means connected to said actuator means for selecting said limited open position.

23. A method of operating a material handling apparatus for moving packages comprising the steps of:

- a) providing a clamshell gripper means having a pair of side linkages and pivotally mounting the side linkages on opposite sides of a longitudinal axis for movement between a clamped position and an unclamped position;
- b) providing a fork-type loader and pivotally mounting the fork-type loader adjacent one of the side linkages for movement between an open position and a pick position;
- c) providing an upper support pad for movement between a disengaged position and an engaged position; and
- d) moving the clamshell gripper to the clamped position and into engagement with opposed sides of a package;
- e) moving the fork-type loader to the pick position and into engagement with a bottom of the package; and
- f) moving the upper support pad to the engaged position and into engagement with a top of the package whereby the package is stabilized for movement.

24. The method according to claim 23 including steps of: g) moving the package to a destination location; h) moving the fork-type loader from the pick position to the open position; i) moving at least one of the side linkages slightly away from the clamped position; j) moving the upper support pad from the engaged position to the disengaged position to release the package; and k) moving the side linkages to the unclamped position.

25. The method according to claim 24 wherein said step i) is performed by moving the at least one of the side linkages slightly away from the clamped position in an arc-like motion.

26. The method according to claim 24 wherein said step i) is performed by moving the at least one of the side linkages slightly away from the clamped position in a generally horizontal motion.